

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

# PCT

To:

see form PCT/ISA/220

## WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing  
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference  
see form PCT/ISA/220

**FOR FURTHER ACTION**  
See paragraph 2 below

International application No.  
PCT/EP2004/002763

International filing date (day/month/year)  
17.03.2004

Priority date (day/month/year)  
11.04.2003

International Patent Classification (IPC) or both national classification and IPC  
C07C17/25, C07C21/06, B01J19/24

Applicant  
VINNOLIT GMBH & CO. KG

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/EP2004/002763

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**Box No. I Basis of the opinion**

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1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.  
☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:  
☐ a sequence listing  
☐ table(s) related to the sequence listing
  - b. format of material:  
☐ in written format  
☐ in computer readable form
  - c. time of filing/furnishing:  
☐ contained in the international application as filed.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/EP2004/002763

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**Box No. II Priority**

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1. ☒ The following document has not been furnished:

☒ copy of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(a)).

☐ translation of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(b)).

Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.

3. Additional observations, if necessary:

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**Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	4-15
	No: Claims	1-3
Inventive step (IS)	Yes: Claims	4-15
	No: Claims	1-3
Industrial applicability (IA)	Yes: Claims	1-15
	No: Claims	

2. Citations and explanations

**see separate sheet**

**Re Item V.**

**1 The following documents are referred to in this communication:**

D1 : US 4 788 357 A

D2 : US 4 798 914 A

D3 : EP 0 270 007

**2 Subject matter**

Claims 1-3 define an apparatus for the production of vinyl chloride by thermal cracking of 1,2-dichloroethane, comprising a cracking furnace, a quench column and purification equipment. The pressure in the cracking furnace is held between 1.4 to 2.5 Mpa. A heat exchanger, which can be heated indirectly, preferably placed immediately before the furnace, is used to treat the 1,2-dichloroethane and controls pressure and temperature fluctuations. The corresponding process, using the cracking apparatus is defined in claims 4-15.

**3 Novelty**

- 3.1 Document D1 discloses (see abstract, figure 1, column 1, lines 52-59 and column 9, line 63-column 10, line 39) the apparatus (cracking furnace, quench column and further purification columns (e.g. hydrogen chloride column) and a heat exchanger before the cracking furnace) and the process for the thermal cracking of 1,2-dichloroethane. A separately heated heat exchanger is used to preheat the 1,2-dichloroethane. Another heat exchanger is installed using steam to preheat the 1,2-dichloroethane immediately before it enters the cracker. The subject-matter of claim 1 is therefore not novel (Article 33(2) PCT).

Claims 2 and 3 define an apparatus with additional heat exchangers installed, which are also disclosed in D1 (see economizer part 9 in Figure 1). Moreover, claim 3 defines a third heat exchanger. However, this claim 3 is also dependent on claim 1, where only one heat exchanger is defined, therefore the term "third heat exchanger" is unclear. Therefore, the subject-matter of claims 2 and 3 are not novel over D1 (Article 33(2) PCT).

Regarding the production process: The operating pressure in the cracking furnace is 1.3 MPa and no pressure control is done by the externally steam heated heat exchanger before the 1,2-dichloroethane enters the furnace. From this, the subject-matter of independent claims 4 differs in that the operating

pressure of the cracking furnace is slightly higher (1.4-2.5 MPa) and the separately heatable heat exchanger is used to control pressure and temperature fluctuations in the cracking furnace. The subject-matter of claim 4 and the dependent claims 5-15 is therefore novel over D1 (Article 33(2) PCT).

3.2 Document D2 discloses (see abstract, figures 1-5, column 3, lines 3-21, examples 1 and 2) the apparatus and process for the thermal cracking of 1,2-dichloroethane. The operating pressure in the cracking furnace is 2.6 MPa and no externally heatable heat exchanger is used to control the pressure before entering the furnace. From this, the subject-matter of independent claims 1 and 4 differs in that the operating pressure of the cracking furnace is slightly lower (1.4-2.5 MPa) and an separately heatable heat exchanger is installed and used to control pressure and temperature fluctuations in the cracking furnace. The subject-matter of claim 1 and 4 is therefore novel over D2 (Article 33(2) PCT)

3.3 Document D3 discloses (see figure 1, column 3, line 54 to column 4, line 29, example 1) the apparatus (cracking furnace, quencher and further steps of operation) and process for the thermal cracking of 1,2-dichloroethane. The operating pressure in the cracking furnace is 3.6 MPa (at the entrance) - 2.3 MPa (at the exit). Two heat exchangers are used to preheat the 1,2-dichloroethane. A separately heated heat exchanger and a heat exchanger which uses the heat from the cracked gas. The subject-matter of claim 1-3 is therefore not novel (Article 33(2) PCT).

The operational conditions of this pyrolysis furnace are set so as to minimize the pressure drop over the EDC-evaporator. From this, the subject-matter of independent claim 4 differs in that the operating pressure of the cracking furnace is slightly lower (1.4-2.5 Mpa) and the separately heatable heat exchanger is installed just before the cracker and this heat exchanger is used to control pressure and temperature fluctuations (and not pressure drop) in the cracking furnace. The subject-matter of claim 4 and its dependent claims 5-15 is therefore novel (Article 33(2) PCT).

#### **4 Inventive step**

As far as the claims are novel, document D1 is considered to represent the most relevant state of the art. It discloses (see abstract, figure 1, column 1, lines 52-59 and column 9, line 63-column 10, line 39) the apparatus and process for the

thermal cracking of 1,2-dichloroethane. The operating pressure in the cracking furnace is 1.3 MPa and no externally heatable heat exchanger is used to control the pressure before entering the furnace.

From this, the subject-matter of independent claims 4 differs in that the operating pressure of the cracking furnace is slightly higher (1.4-2.5 MPa) and an separately heatable heat exchanger is installed and used to control pressure and temperature fluctuations in the cracking furnace.

The problem to be solved is an alternative energy efficient heat recovery process, while at the same time the operating time of the cracking furnace is improved, due to a more stable cracking operation.

The solution to this problem proposed in claim 4 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

There is no suggestion in D1 that a more stable cracking operation using the separately heatable heat exchanger, to be installed before the cracker, can also be used to compensate for pressure fluctuations in the cracking system, operating at higher operating pressures.

Compared to claim 4, the dependent claims 5-15 contain extra features which have no influence on the core invention. Thus, the same problem-solution-approach as outlined above is valid. Therefore, the solution proposed in the dependent claims 5-15 of the present application can also be considered as involving an inventive step (Article 33(3) PCT).

## **5 Other remarks**

In claim 4, the term "the system" is unclear and should be better defined.